engineering data and the capacities and prices of equipment necessary to provide the function on the route

The Route Inventory Table also gives the Fiber Investment for each least cost route, or the investment in fiber cable necessary to connect the 'A' and 'Z' wire centers considering the least cost route and the two cost drivers (wire center size and mileage between offices).

Two other important pieces of information given on this table include the number of air miles between the wire centers and the number of lines (or circuits) on the route between the wire centers.

As mentioned above, there are nine different Route Inventory Tables for DS-1 (or DS-3), and each of these tables concerns a different Cost Driver Combination (ex., the Route Inventory Table for the Large to Large wire center, 0-20 mile Cost Driver Combination will have different 'A' to 'Z' routes and thus different Route and Fiber Investments as well as different numbers of air miles and circuits for each route than the Route Inventory Table for the Large to Small, 50+ mile Cost Driver Combination.). Also note that the Route Investment figure refers to investment in Circuit Equipment Account, and the Fiber Investment figure refers to investment in Underground and/or Buried Cable Equipment Accounts.

b. Billing Analysis Table

Another table used by the COSTPROG Line Haul Module in determining line haul equipment unit investment is the Billing Analysis Table. This table uses the Route Investment determined for each route and the Number of Circuits in each route to find the Total Raw Fixed Cost for an average route. This Circuit Equipment Account value is transferred to the BNF LRIC study for the particular Cost Driver Combination being costed for the BNF (For an example, see Calculations Tab 1, Schedule A-1, Line 1, in the DS-1 Dedicated Interoffice Facility BNF LRIC Study). Since this calculation is for Circuit Equipment only, the Total Raw Fixed Cost appears on an ACF sheet in the BNF study only for the First Mile of equipment for the Cost Driver Combination. Since each additional mile of line haul equipment uses no equipment from the Circuit Account, the Total Raw Fixed Cost for the Circuit Equipment does not appear for additional miles of equipment for the Cost Driver Combination

This calculation of Total Raw Fixed Cost for Circuit Equipment is done similarly for each of the nine combinations of cost drivers in each of the two Digital Service Dedicated Interoffice Facility per Bandwidth Specific I/O Channel BNF LRIC studies.

c. Per Mile Facility Cost Table

Another table in the COSTPROG Line Haul Module is the Per Mile Facility Cost Table. This table is for the Fiber Investment (taken from the Route Inventory Table) what

the Billing Analysis Table is for the Route Investment. Using Fiber Investment in each route, the Number of Circuits in each route, and the Air Miles in each route, this table computes the Raw Fiber Cost for an average route. Unlike what is done with the results of the Billing Analysis Table, the results of the Per Mile Facility Cost Table are not immediately transferred to the ACF Sheets in the BNF studies. Instead, they are input into the Outside Plant Split Table.

d. Outside Plant Split Table

The last table in the COSTPROG Line Haul Module, the Outside Plant Split Table, calculates the investment in fiber as divided between the Underground and Buried Fiber Equipment Accounts. The first calculation performed by this table is the multiplication of the Raw Fiber Investment from the Per Mile Fiber Investment Table by the Percentage of Total Fiber (in Texas) that is Underground Fiber to obtain the Weighted Unit Cost of Underground Fiber Cable. Shown below is the equation used to find this Weighted Unit Cost of Underground Fiber Cable.

Raw Fiber Investment * % of Total Fiber that is Underground Fiber =

Weighted Unit Cost of Underground Fiber

A similar calculation is done to determine the Weighted Unit Cost of Buried Fiber Cable.

However, while the Weighted Unit Cost of Buried Fiber Cable gets entered into the ACF sheets in the BNF studies in the Buried Fiber Equipment Account (for both the First and Additional Miles), the Weighted Unit Cost Underground Cable requires additional treatment. The *conduit* that the underground fiber must run through is included in the final unit cost for the Underground Fiber Cable Account for each Cost Driver Combination. This conduit is accounted for by multiplying the Weighted Unit Cost of Underground Fiber from the Outside Plant Split Table by a Conduit Factor that SWBT says serves as a proxy for the cost of conduit relative to the cost of fiber. The result of this calculation is the Adjusted Weighted Unit Cost for Underground Fiber. Shown below is the equation used to find this Adjusted Weighted Unit Cost for Underground Fiber.

Wtd. Unit Cost of Underground Fiber * Conduit Factor = | Adjusted Wtd. Unit Cost for Underground Fiber |

The Adjusted Weighted Unit Cost for Underground Fiber is transferred to the ACF sheets (for both the First and Additional Miles) in the Underground Fiber Account.

The calculations of Weighted Unit Costs for Underground and Buried are performed similarly for each of the nine Cost Driver Combinations of in each of the two Digital Service Dedicated Interoffice Facility per Bandwidth Specific I/O Channel BNF LRIC studies (For an example, see Calculations Tab 1, Schedules A-2 and A-3, Line 1, in the DS-1 Dedicated Interoffice Facility BNF LRIC Study). The outputs of each of these tables and where they are used are listed in Figure 5.

Figure 5: Outputs for Each Set of Tables in the COSTPROG Line Haul Module

Name of Table	Major Output(s)	Major Outputs Transferred to:
Route Inventory Table	1) Route Investment 2) Fiber Investment 3) Number of Air Miles 4) Number of Circuits	1) Billing Analysis Table 2) Per-Mile Facility Cost Table 3) Billing Analysis and Per-Mile Facility Cost Tables 4) Per-Mile Facility Cost Table
Billing Analysis Table	1) Total Raw Fixed Cost for Route Equipment	1) ACF Sheet in BNF Study
Per-Mile Facility Cost Table	1) Raw Fiber Cost	1) Outside Plant Split Table
Outside Plant Split Table	1) Weighted Unit cost of Buried Fiber Cable 2) Adjusted Weighted Unit Cost for Underground Fiber	1) ACF Sheet in BNF Study 2) ACF Sheet in BNF Study

5. Staff Review and Recommendation of the COSTPROG Line Haul Module

Staff has participated in meetings with representatives from SWBT to develop an understanding of both the theoretical basis and the application of the COSTPROG Line Haul Module used in DS-1 and DS-3 Dedicated Interoffice Facility per Bandwidth Specific I/O Channel BNF LRIC studies filed in this project. Staff's review of the Line Haul Module has entailed verification of calculations used to determine line haul equipment unit costs. To facilitate the verification of the calculations used to develop the unit costs for line haul equipment, Staff obtained from SWBT representatives the tables, engineering data, and equations that are used to develop these costs. Due to the volume

of unit costs output from the COSTPROG Line Haul Module, Staff attempted to duplicate only a sample of the unit costs of each type of line haul equipment (for both first and additional miles) and each Cost Driver Combination. The sample was, however, extensive enough that Staff verified the mathematical accuracy of the unit cost for each equipment account and each Cost Driver Combination at least once. Staff also verified that the unit costs developed by the COSTPROG Line Haul Module were transferred correctly to the ACF Sheets in the BNF studies. While most of the equations supporting the unit costs developed in the Line Haul Module investment studies are not mathematically challenging, they have technical specifications that require knowledge of the particular line haul equipment to be fully understood. Nevertheless, Staff reviewed the formulas and determined them to be reasonable, but with a few concerns.

One concern involves the 'bundling' of the conduit investment into the Underground Fiber Unit Investment. As will be seen in the explanation of the LPVST Model, conduit has its own equipment account, separate from the Underground Fiber Cable Account. One problem with this combination of the two accounts into one is that by including Conduit as a part of the Underground Fiber Cable, on the ACF Sheet the Annual Charge Factors for the Equipment Investment in the Underground Fiber Account is applied to the Equipment Investment in the Conduit Account. Instead, the investment in conduit should be entered into its own equipment account, and thus have the appropriate (conduit) ACFs applied to it.

According to SWBT, in order to avoid this misapplication of Underground Fiber Account ACFs to conduit equipment unit investment, a rather large reprogramming would

have to be performed on the COSTPROG Line Haul Module SWBT also maintains that this reprogramming is tentatively being planned, but there is no actual schedule for when it will be done. Staff realizes the task of reprogramming the Line Haul Module to separate these Underground Fiber and Conduit Equipment Accounts may be a large task. However, Staff is still concerned with the misrepresentation of costs (however small) caused by the placing of unit investment for conduit into the Underground Fiber Account. Both SWBT and Staff have performed calculations that demonstrated that this misapplication has an insignificant effect on the results of the studies filed in this project. Due to this insignificant impact, and given the fact that SWBT is planning to reprogram the COSTPROG Line Haul Module to prevent the misapplication, Staff sees no reason for SWBT to correct this error when it files amended DS-1 and DS-3 Dedicated Interoffice Facility BNF LRIC studies. However, in future BNF LRIC studies using the Line Haul Module, Staff will verify that this misapplication (if not yet corrected) has a minimal effect on the result of the studies.

Staff has another concern regarding the treatment of conduit, but this concern will be addressed more appropriately in the discussion of the LPVST Model (See page 52).

Staff believes that the COSTPROG Line Haul Module is a valid tool for use in developing costs assuming the misapplication regarding the conduit equipment continues to have an insignificant impact on the results of all BNF LRIC studies using the module. Furthermore, the complexity of the model, the sheer volume of the inputs to the model, and the calculation of line haul equipment unit costs, in many cases without regard to the service using those resources, all make it difficult for the model to be manipulated. On a

going forward basis, for SWBT line haul LRIC studies, Staff will at a minimum check to see that the correct unit costs from the COSTPROG Line Haul Module are transferred to the ACF Sheets in the BNF LRIC Studies If SWBT develops new COSTPROG Line Haul Module outputs pursuant to a new release of the cost models, Staff will once again review the calculations as needed. Also, as stated above, Staff will continue to verify that the misapplication of Underground Cable Account ACFs to investment in conduit has minimal impact on the results of each BNF LRIC study

While Staff believes that the COSTPROG Line Haul Module used by SWBT may be utilized in a manner consistent with the principles, instructions, and requirements set forth in §23.91, Staff reserves the right to challenge a specific application of the module in future LRIC studies if Staff believes SWBT is using the module in a manner inconsistent with the principles, instructions, and requirements set forth in § 23.91.

E. COSTPROG SAF Module

There are five NAC BNF LRIC studies in this project that use the SAF unit investments of the COSTPROG model. These studies are for the NAC DS-1 Level per NAC, NAC DS-3 Level Quantity 1 per NAC, NAC DS-3 Level Quantity 3 per NAC, NAC DS-3 Level Quantity 6 per NAC, and NAC DS-3 Level Quantity 12 per NAC BNFs, ('NAC BNF LRIC studies').

In addition to these NAC BNF LRIC studies, there are two Multiplexing BNF studies in this project using COSTPROG to calculate SAF equipment unit investments: Voice Grade to/from DS-1 Multiplexing per Arrangement and DS-1 to/from DS-3 Multiplexing per Arrangement ('Multiplexing BNF LRIC studies'). These studies compute the BNF unit costs involved in transferring from one type of line capacity to another.

One other BNF LRIC study filed in this project uses results from the SAF Module in COSTPROG. This study, Dedicated Network Access Channel Connection DS-3 Level Connection ('DS-3 NACC BNF LRIC study'), identifies the unit cost of the wiring necessary to connect the NAC to the switching facilities in the central office.

Although the above studies do use the SAF Module of the COSTPROG, the outputs of this module often require more information (from the LPVST Model) before being entered onto an ACF Sheet in a BNF LRIC study. The SAF Module is run differently for each of the above mentioned types of BNF studies. However, due to the fact that the bulk of the studies filed in this project requiring SAF-generated inputs are the NAC BNF LRIC studies, the discussion of the COSTPROG model's calculation of unit capacity costs will focus on these studies. The differences in the application of the COSTPROG SAF Module to the Multiplexing and NACC BNF LRIC studies will be discussed later.

1. COSTPROG SAF Module Equipment Accounts

Like the COSTPROG Line Haul Module, the COSTPROG SAF Module can find unit costs for more than one equipment account. This module finds unit costs for both of the equipment accounts used in the NAC BNF LRIC studies, the Premises (Circuit) Equipment Account and the Central Office (Circuit) Equipment Account. The equipment in the Premises Equipment Account is equipment required at a location other than the central office (such as at a customer's premises) where cable (fiber or copper) must be connected in order to provide the BNF The Central Office Equipment Account ('CO Equipment') is equipment necessary in the central office to provide the NAC BNF.

Each DS NAC BNF is a function of different accounts of equipment. Some of these accounts, such as central office equipment and customer premises equipment, use the SAF Module of COSTPROG to develop their unit costs. The unit capacity costs for other equipment accounts, such as buried cable, are computed in the LPVST Model (which is not part of the COSTPROG Model). The LPVST Model and its application to the DS NAC BNF LRIC studies will be discussed later in this document.

2. DS-1/DS-3 Technologies

While DS-1 uses both copper and fiber cable as the least cost technologies in providing the DS-1 NAC BNF, the DS-3 NAC BNFs are provided only through fiber

cable. Thus, the main difference between the DS-3 COSTPROG SAF Module calculation and the DS-1 COSTPROG SAF Module calculations is that the computation in the DS-1 study obtains unit investments for central office (CO) and premises equipment to interface with both copper and fiber cable, whereas the computation in the DS-3 study obtains the unit costs for CO and premises equipment to interface with fiber cable only. Thus, in the DS-1 study, there are therefore four different calculations reported by the SAF Module (one for each equipment account for each cable type), while in the DS-3 study there are only two different calculations reported by the SAF Module. Because the DS-1 NAC BNF LRIC study is more inclusive, it will be referred to in the following description of the SAF Module. However, references to the DS-3 NAC BNF LRIC studies will be made when necessary.

3. DS-1 and DS-3 NAC BNF Cost Drivers

As in the COSTPROG Line Haul Module, each NAC BNF is separated into three separate cost drivers: wire center size, density of lines, and mileage band. The wire center size, similarly to what was discussed before in the explanation of the COSTPROG Line Haul Module, refers to the number of lines serviced by a central office. A Wire Center 1 (WC1) designation refers to a central office with up to 10,000 lines going into it. A WC2 designation refers to a central office with more than 10,000 lines going in.

The Density Cost Driver refers to the number of lines per square mile in the area served by a wire center. A Density 1 (D1) designation refers to an area with a

concentration of up to 500 lines per square mile A D2 designation refers to an area with more than 500 lines per square mile Note that wire center size and density are somewhat related. For example, a WC2 may have a D1 density, but a WC1 will not have a D2 density. In other words, a large wire center may serve a low density of lines, but a small wire center cannot serve a large density of lines

The Mileage Band refers to the length of the line in kilofeet. A Mileage Band 1 (MB1) designation refers to lines of up to 15 kilofeet (15,000 feet). An MB2 designation refers to lines longer than 15 kilofeet.

Each of these types of cost drivers is combined into a three-category combination of cost drivers for the SAF equipment in a central office. The COSTPROG SAF Module calculates costs for six such combinations for each of the five DS NAC BNFs (one DS-1 BNF and four DS-3 BNFs), producing 30 separate Cost Driver Combinations among the BNF studies. The six Cost Driver Combinations are summarized in Figure 6. Note that due to their relationship, the wire center and the density designations have been combined.

Figure 6: Cost Driver Combinations for DS-1 and DS-3 NAC BNF LRIC Studies

Mileage Band / Wire Center/Density	Up to 15 kilofeet	More than 15 kilofeet
Up to 10,000 lines per office and Up to 500 lines per mile	WC1/D1/MB1	WC1/D1/MB2
More than 10,000 lines per office and Up to 500 lines per mile	WC2/D1/MB1	WC2/D1/MB2
Up to 10,000 lines per office and More than 500 lines per mile	N/A	N/A
More than 10,000 lines per office and More than 500 lines per mile	WC2/D2/MB1	WC2/D2/MB2

Note that the Cost Driver Combinations listed in the table above are also used by the LPVST Model in finding the unit costs for the DS NAC equipment not obtained in the SAF Module. As stated above, the LPVST model will be discussed later in this document.

4. SAF Module Calculation of DS-1 NAC BNF Unit Costs

The COSTPROG SAF Module uses three types of tables (one of which is not actually part of the SAF Module) and related calculations to compute the unit investment for each account of SAF equipment in the DS NAC Investment studies.

a. Equipment Investment Summary Table

The first table, the Equipment Investment Summary Table, develops the cost of buying the necessary supply of each individual part that comprises each piece of SAF equipment for the DS NAC BNF (The DS-1 Equipment Investment Summary Table can be seen behind Tab II in the Network Access Channel DS-1 Level Investment Binder). This table names each of these parts and designates a particular type of formula or 'Total Investment Equation' used to calculate the Total Investment and the Unit Investment for each part. The Total Investment is determined by applying the Total Investment Equation to the Part Price (also included on this table).

The Total Investment Equation, which is different from part to part, is based on the different Engineering Factors, and the Sales Tax and Power Investment Factors for each particular type of part. As seen in previously-filed LRIC studies (See GC Comments on 14091), these factors are generally applied to the Equipment Investment on the ACF Sheets in the BNF LRIC studies in the form of EF&I, Sales Tax, Telco Engineering, Telco Plant Labor, Sundry and Miscellaneous, and Power Investment Factors. However, SWB explained that many of the part prices that SWB gets from the purchasing department and inputs to the SAF Module vary in whether or not they already include the sales tax, engineering, and power investment costs in the price. Therefore, SWB decided to apply these factors individually as necessary to each part costed in the SAF Module.

For example, if the price of a certain part that SWB inputs into the model includes the sales tax for that part, this is accounted for in the Total Investment Equation, and sales tax is not reapplied to the part. However, another type of part that goes into this SAF equipment account may not include sales tax in its input price. The Total Investment Equation for this particular part will factor in the sales tax when computing the Total Investment for this part. Therefore, all the outputs of the equipment accounts costed in the SAF Module will already have the necessary Engineering, Power, and Sales Tax Factors applied and do not have them applied on the ACF Sheet for that equipment account in the BNF study. SWB says that this method of accounting for the Capital Investment Factors leads to a more accurate calculation of Total Investment for these particular pieces of equipment.

The Equipment Investment Summary Table then multiplies the Total Investment in a part by the Capacity, or the quantity of that particular part type that is needed to provide the BNF to obtain the Total Investment (in Parts) for a type of part. The Percentage Utilization of that part type (allowing for unused capacity for testing or spares, for example) is inserted into an equation (the 'Unit Investment Equation') which is, like the Total Investment Equation, based on similar factors applied to the Total Investment. This calculation results in the Unit Investment (for a part type). This is the investment per type of part required in construction of the SAF equipment that provides the NAC DS Level BNF.

b. Parts Table

The second table used by the SAF Module column lists each of the parts needed in each type of SAF equipment necessary in either the Central Office or Customer Premises Equipment Accounts (The DS-1 Parts Table can also be seen behind Tab II in the Network Access Channel DS-1 Level Investment Binder). This table also gives the Total Unit Investment for this equipment by adding up the Unit Investments in Parts (as found on the Equipment Investment Summary Table) for each type of part that goes into each of the equipment accounts.

c. BNF Matrix

For each DS NAC BNF, the Total Unit Investment for CO equipment and customer premises equipment for each type of cable used by the BNF is entered into a third table, called the BNF Matrix (one of which can be seen behind Subtabs A, B, or C behind Tab I in the Network Access Channel DS-1 Level Investment Binder). While this table is not actually a part of the SAF Module, it is instrumental in completing the process through which the BNF unit investments are developed.

For the DS-1 BNF, this table is divided into two sides, one for copper interface equipment for each of the two equipment accounts and one for fiber interface equipment for each of the two equipment accounts. The BNF Matrix is also divided into an upper level and a lower level. The upper level is for entries for MB1 of a cost driver category (whether it is WC1/D1/MB1, WC1/D2/MB1, or WC2/D2/MB1). The lower level of the BNF Matrix is for entries for MB2 of a Cost Driver Combination (whether it is WC1/D1/MB2, WC1/D2/MB2, or WC2/D2/MB2).

Note that because there are six different Cost Driver Combinations and three such combinations each including MB1 and MB2, there are actually three BNF Matrices to accept the outputs of the SAF Module for DS-1. One for WC1/D1/MB1 and MB2, one for WC2/D1/MB1 and MB2, and one for WC2/D2/MB1 and MB2 (one behind Subtab A, one behind Subtab B, and one behind Subtab C of Tab I of the Network Access Channel DS-1 Level Investment Binder). For each of the two mileage bands for each Cost Driver Combination, a BNF Matrix calculates the Final Account Unit Investment for a DS-1

NAC BNF. This Final Account Unit Investment is entered onto an ACF Sheet in the DS-1 NAC BNF LRIC study.

Since the calculations of Final Unit Investments are done for both SAF equipment accounts (CO Equipment and Premises Equipment) for each of the six Cost Driver Combinations, there are actually 12 Final Account Unit Investment values transferred from the SAF Module to the DS-1 NAC BNF study (four from each BNF Matrix). Therefore, there are 12 different ACF Sheets in the DS-1 NAC BNF study.

As mentioned above, the SAF Module computes Final Unit Investments for the DS-3 NAC BNF studies using a method much like that for the DS-1 study.

Figure 7 shows the outputs of each table and where these outputs are used in the COSTPROG SAF Module.

Figure 7: Outputs for Each Set of Tables in the COSTPROG SAF Module for the DS-1 NAC BNF Study

Name of Table	Major Output(s)	Major Output Transferred to:
Equipment Investment Summary Table	Unit Investment for a Part Type	Parts Table
Parts Table	1) Total Unit Investment for Central Office Equipment Account 2) Total Unit Investment for Central Office Equipment Account	1) BNF Matrix 2) BNF Matrix
BNF Matrix	1) Total Unit Investment for CO (MB1) 2) Total Unit Investment for Premises (MB2)	1) ACF Sheet in BNF Study 2) ACF Sheet in BNF Study

5. COSTPROG SAF Module and the Multiplexing and NACC BNFs

For the two Multiplexing BNF LRIC studies and the DS-3 NACC BNF LRIC study, the SAF Module computes the Total Unit Investments using methods described for the first two tables used by the DS NAC BNFs (Equipment Investment Summary Table and Parts Table, which can be seen for the multiplexing studies in the DS-1 to/from DS-3 Multiplexing Investment Study and the Voice Grade to/from DS-1 Multiplexing Investment Study, and for the NACC study in the Dedicated Network Access Channel Connection DS-3 Level Investment Study) However, because neither the multiplexing nor the NACC equipment is dependent on the length of cabling (i.e., mileage band), these studies do not use the BNF Matrix that the SAF Module DS NAC BNFs do. Thus, for the Multiplexing and the DS-3 NACC BNFs, the Total Unit Investment in each equipment account from the SAF Module is directly entered onto the ACF sheets in the BNF studies to find the BNF's Total Monthly Cost for the particular Multiplexing or NACC BNF.

6. Staff Review and Recommendations

Staff has participated in meetings with representatives from SWBT to develop an understanding of both the theoretical basis and the application of the COSTPROG SAF Module used in the Network Access Channel per DS-1 Level per NAC, Network Access

Channel per DS-3 Level Quantity 1 per NAC, Network Access Channel per DS-3 Level Quantity 3 per NAC, Network Access Channel per DS-3 Level Quantity 6 per NAC, Network Access Channel per DS-3 Level Quantity 12 per NAC, DS-1 to/from DS-3 Multiplexing per Arrangement, Voice Grade to/from DS-1 Multiplexing per Arrangement, and Dedicated Network Access Channel Connection DS-3 Level per Channel Connection BNF LRIC studies filed in this project. Staff's review of the SAF Module has entailed verification of calculations used in its module to determine SAF equipment unit costs. To verify the calculations used to develop the unit costs for this equipment, Staff used tables, engineering and vendor price data, and equations that are used to develop these costs obtained from SWBT representatives. Staff to attempted to duplicate all of the unit costs output by the SAF Module for each BNF LRIC study using such equipment. Staff also verified that the unit costs developed by the COSTPROG SAF Module were transferred correctly to the ACF Sheets in the BNF studies. While most of the equations supporting these unit costs are not mathematically challenging, some have technical specifications that require specific knowledge of the particular equipment to be fully understood. Nevertheless, Staff reviewed the formulas and determined them to be reasonable. However, Staff did discover two related errors on the ACF Sheets in the BNF studies for two of the BNFs for which LRIC studies were filed in this project.

Both the Voice Grade to/from DS-1 Multiplexing and the DS-3 Dedicated NACC BNF LRIC studies include an inappropriate application of a TPI (Telephone Price Index) factor to the Equipment Investment on the ACF Sheet before the Annual Charge Factors

are applied. SWBT has recognized these errors and will correct them when they refile the BNF LRIC studies filed in this project

Staff, after a thorough review of the COSTPROG SAF Module, believes that it can be a valid tool for use in developing costs, given the following alteration. While Staff has no concerns regarding the application of the Engineering and Sales Tax Factors to investment in the SAF Module rather than in the BNF studies, Staff does not believe the Power Investment Factor belongs in the BNF LRIC studies (as discussed on page 68 in Staff's recommendations for the Annual Charge Factors in these LRIC studies). Therefore, Staff recommends the ALJ to order SWBT to file amended BNF LRIC studies for this project, removing the Power Investment Factor from the calculations performed in the SAF Module, and reported as a common cost when such common cost studies are performed.

On a going forward basis, for SWBT NAC, Multiplexing, and NACC LRIC studies, Staff will at a minimum check to see that the correct unit costs from the COSTPROG SAF Module are transferred to the ACF Sheets in the BNF LRIC Studies. If SWBT develops new COSTPROG SAF Module outputs pursuant to a new release of the cost models, Staff will once again review the calculations as needed.

While Staff believes that the COSTPROG SAF Module used by SWBT may be utilized in a manner consistent with the principles, instructions, and requirements set forth in §23.91, Staff reserves the right to challenge a specific application of the module in future LRIC studies if Staff believes SWBT is using the module in a manner inconsistent with the principles, instructions, and requirements set forth in § 23.91.

F. LPVST Model

There are five BNF LRIC studies in this project that use the LPVST computer program in their calculation of unit costs These are the same five DS NAC BNF LRIC studies discussed in the explanation of the SAF Module of the COSTPROG Model above. As with the SAF Module, the following LPVST Model description concentrates on the DS-1 as it uses both copper and fiber cable and the related equipment accounts. Where necessary, references will be made to DS-3 equipment and calculations.

Like in the COSTPROG Line Haul Module, LPVST uses samples of lines in order to find a representative capacity cost for equipment accounts related to these lines. However, the lines LPVST develops unit costs for are for local distribution facilities rather than the interoffice facilities that the Line Haul Module develops unit costs for.

1. Cable in LPVST

As in the SAF Module, LPVST calculates unit costs for DS-1 NAC BNF LRIC for both copper and fiber cable. However, in using LPVST, SWBT also divides the cable further into cable used as Feeder and cable used for Distribution. Feeder cable is cable coming from a central office and going to a central distribution center. From this central distribution center, the cable is directed towards customer premises (hence, Distribution

Cable). Each of these two types of cable (Feeder or Distribution) uses its own set of LPVST tables for finding its unit costs (although the tables are basically the same in layout, they use different values for the different types of cable).

2. LPVST Equipment Accounts

Like the COSTPROG modules used in the DS BNF LRIC studies filed in this project, the LPVST Model finds unit costs for many different equipment accounts. The Underground and Buried Fiber Accounts are for fiber cable used in providing DS-1 and DS-3 (as seen in the discussion of the COSTPROG Line Haul Module). The Conduit Account is for the protective pipe required around Underground Cable before it is put into the ground. Note that the LPVST Model costs conduit out differently than the COSTPROG Line Haul Module. While the Line Haul Module includes the cost of Conduit in the Underground Fiber Account (See page 25), LPVST separates the Underground Fiber and Conduit investments into two different accounts. According to SWBT, this difference in treatment of conduit is just due to programming differences between the two models that will eventually be remedied when time can be found to do a major reprogramming. SWBT says that theoretically, the LPVST Model is correct in separating the Underground Fiber and Conduit Accounts.

In addition to determining the unit costs for the three equipment accounts described above for both DS-1 and DS-3, LPVST also develops unit costs for additional equipment accounts in the DS-1 NAC BNF LRIC studies. These equipment accounts are

the Aerial Cable Account, the Pole Account, the Buried (Metallic) Cable Account, and the Underground (Metallic) Cable Account The Aerial Cable Account contains the cost of metallic cable strung on telephone poles, as well as the drop wire connecting these lines to a customer's premises The poles that aerial cable is strung upon are included in the Pole Account. The Buried Metallic and Underground Metallic Cable Accounts are similar to the Buried Fiber and Underground Fiber Cable Accounts, except for the material composition of the cable. Note that for most accounts in LPVST, as in COSTPROG, sales tax, telco engineering, telco labor, shipping expenses are applied within the investment study, and not on the ACF Sheet in the BNF study.

3. LPVST Cost Drivers

The cost drivers used in the LPVST Model are the exact same cost drivers as used in the COSTPROG SAF Module. In fact, the same BNF Matrices that receive the outputs of the SAF Module also receive the outputs of the LPVST Model.

4. Structure of the LPVST Model

There are nine tables that LPVST uses to calculate the unit investments in cable (and related) equipment. However, there are 15 different sets of these nine types of

tables, as LPVST determines these investments for different combinations of copper and fiber cable, Feeder and Distribution cable, and MB1 and MB2 Cost Driver Combinations.

a. Cable Feet Table

The first of these tables, the Cable Feet Table, breaks down the number of feet of each cable type (copper or fiber, depending on mileage band or whether the table refers to Feeder or Distribution cable) that is used in each *kilofoot*. Also represented on this table is the Total Number of Samples. As mentioned before, there are 15 Cable Feet Tables, each similar in form, but differing in specific values entered therein. For the DS-1 NAC, the Cable Feet Table for Cost Driver Combination WC1/D1/MB1 can be seen behind tab 1 in Subtab A, Tab III in the Network Access Channel DS-1 Level Investment Binder (page 1).

b. Cable Percentage Table

The second LPVST table, the Cable Percentage Table, is identical in size, shape and structure to the Cable Foot Table. The only difference between the two tables is this table contains the percentage of total cable samples (used in the study) that is found in each kilofoot (i.e., the first kilofoot, the second kilofoot, etc.).

c. Theoretical Resistance Table

The next table used by LPVST is the Theoretical Resistance Table. This table uses wire thickness (gauge) and kilofoot delineations (one kilofoot, two kilofeet, and so on) to aid in determining the size of wiring necessary to provide adequate transmission over a given number of kilofeet. As a general rule, the more kilofeet a signal must travel over, the larger gauge the wire it travels over must be. This table reports exactly what gauge a wire must be in order to carry a signal over a given amount of kilofeet. As discussed above, this table is seen 15 different times in the LPVST computation of unit investments for the DS-1 NAC BNF. This table is exactly the same for all sets of LPVST tables developing the unit investment for copper cable. The reason for this is that the laws of physics dictate how far a signal can be carried over a certain gauge of wire. These laws are constant for a given metal (copper in this case) regardless of whether or not the material is being used as feeder or distribution cable, for example. However, this table is irrelevant for fiber cable (i.e., all MB2 and some MB1 Feeder cable). Since fiber cable relies on light signals rather than electrical signals, it need not vary in gauge based on the distance the signal will be sent. For the DS-1 NAC, the Theoretical Resistance Table for Cost Driver Combination WC1/D1/MB1 can be seen behind tab 1 in Subtab A, Tab III in the Network Access Channel DS-1 Level Investment Binder (page 3).